Animal Bites and Rabies Post-Exposure Prophylaxis (PEP)

1. REPORTING

A. Purpose of Reporting and Surveillance

1. To assess the risk of rabies exposure in persons bitten or otherwise exposed to animal saliva or other potentially infectious material (such as central nervous system tissue), determine the need for rabies post-exposure prophylaxis (PEP), and provide counseling to those who don't require rabies PEP.
2. To facilitate the capture and confinement of potentially rabid animals (involved in a human exposure) which have a defined observation period (dogs, cats, and ferrets); or facilitate histological examination of the brain of potentially rabid animals (involved in a human exposure) when those animals cannot be observed.

B. Legal Reporting Requirements

Animal Bites

1. Health care providers: **immediately notifiable to local health jurisdiction**.
2. Hospitals: **immediately notifiable to local health jurisdiction**.
3. Laboratories: no requirements for reporting.
4. Veterinarians: **immediately notifiable to local health jurisdiction**.
5. Local health jurisdictions: no requirements for reporting, however staff at the Washington State Department of Health (DOH) Communicable Disease Epidemiology Section (CDES) are available for consultation on management of animal bites as needed.

Rabies Post-Exposure Prophylaxis

1. Health care providers: notifiable to local health jurisdiction within 3 work days.
2. Hospitals: notifiable to local health jurisdiction within 3 work days.
3. Laboratories: no requirements for reporting.
4. Local health jurisdictions: notifiable to CDES within 7 days of case investigation completion or summary information required within 21 days.

C. Local Health Jurisdiction Investigation Responsibilities

1. Begin investigation when the animal bite is reported.
2. Counsel the patient and/or health care provider regarding the risk of rabies exposure and need for rabies PEP.
3. Facilitate the capture and 10-day confinement of dogs, cats, and ferrets involved in a human exposure.
4. Facilitate transport of animal heads for rabies testing to the Washington State Department

of Health Public Health Laboratories (PHL). Call CDES prior to submitting specimens.

5. Report all persons who have rabies PEP initiated to CDES. Complete the rabies PEP case report form (http://www.doh.wa.gov/Notify/forms/rabies_pep.pdf) and enter the data into the Public Health Issues Management System (PHIMS).

   Note: Case report forms are available for animal bites (www.doh.wa.gov/notify/forms/ani_bites.pdf), but animal bites do not need to be reported to CDES.

2. RABIES AND ITS EPIDEMIOLOGY

Background

Rabies virus causes an acute encephalitis in mammals, including humans, and the outcome is virtually always fatal. In the United States, an average of two to three human rabies deaths are reported per year. During the past 25 years, two human rabies cases have been diagnosed in Washington. For more information on human rabies, please see the Surveillance and Reporting Guidelines for rabies found at: http://www.doh.wa.gov/notify/guidelines/pdf/rabies.pdf.

A. Etiologic Agent

The disease is caused by the rabies virus (Family *Rhabdoviridae,* genus *Lyssavirus*). In the United States, there are several rabies virus variants (strains) circulating among reservoir hosts including raccoon, fox, skunk, and bats.

B. Description of Illness in Animals

Rabid animals can show a range of symptoms, often described as either "dumb" or "furious" rabies; they may progress from one state to the other. Dumb rabies is characterized by reclusive behavior, drooling, anorexia, a startled response to sudden noise or light exposure, and irritation around the site of the bite, resulting in frequent licking and biting of the area. Furious rabies is marked by excitation and marked aggressiveness, notably biting of objects, animals, humans, or even self. Salivation can be profuse due to difficulty swallowing and there is often a change in voice. Central nervous system signs of rabies may include paralysis, poor coordination, convulsions and coma. Wildlife may lose their fear of people; animals normally active only between sunset and sunrise may be seen during daylight hours. Infected bats may act strangely (e.g., crawling, hissing).

C. Reservoirs

In Washington, Oregon, and Idaho, bats are the primary reservoir species, and other animals (notably potential bat predators such as foxes or cats) are rarely infected as "spillover" from rabid bat populations. In other parts of the United States, skunks, raccoons and foxes are important reservoirs (in addition to bats). In some parts of the world, dogs and other carnivores may be important reservoirs.

D. Animals Rabies in Washington State and the Pacific Northwest

Bats are the only known reservoir for rabies in Washington State and rabid bats are found throughout the state. The percentage of bats in the wild that are infected with rabies is very low (less than 1%), however 5–10% of the sick and injured bats submitted for

testing in Washington are rabid (see Table 1). Rabies has also occurred recently in animals other than bats (Table 2).

Bats are also the primary reservoir for rabies in Oregon, Idaho, and British Columbia. However, during 2000–2007, rabid non-bat animals were detected in these states and province. Oregon identified six rabid foxes with bat-variant rabies during 2000–2007. Idaho detected a rabid bobcat in 2001 and a rabid skunk in 2004 both with bat-variant rabies. British Columbia found 4 skunks in a park in Vancouver in 2004 and a cat in 2007 all infected with bat-variant rabies. This clearly demonstrates that rabies in bats spills over to other wild animals, as well as domestic animals.

Table 1: Rabid Bats Detected in WA, 2000–2007

Year	Rabid bats / Total no. bats tested (%)
2007	22/315 (7)
2006	15/273 (5)
2005	15/245 (6)
2004	20/311 (6)
2003	23/229 (10)
2002	12/186 (6)
2001	22/263 (8)
2000	23/330 (7)

Table 2: Rabid Non-Bat Animals and Rabies Strain Type in WA, 1986–2007

Year	Animal type (County)	Rabies Strain
2002	Cat (Walla Walla)	Bat-variant
1994	Llama (King)	Bat-variant
1992	Horse (Franklin)	Unknown
1987	Dog (Pierce)*	Unknown, but history of bat exposure

* infection was not confirmed at CDC

E. Modes of Transmission

Rabies may be transmitted when infected saliva or other potentially infectious material (such as central nervous system tissue) penetrates the skin or contaminates mucosa of a susceptible mammal. Although person-to-person transmission of rabies by bite has never been confirmed, rabies can be transmitted via corneal and organ transplantation. Limited evidence also suggests that rabies might be transmitted by exposure to very large amounts of aerosolized rabies virus (e.g., exposure to millions of bats in a cave). Rabies is not transmitted by contact with blood, urine or feces, or by touching fur. The virus becomes inactive with drying.

F. Incubation Period of Rabies in Animals

Based on observational studies, dogs, cats and ferrets have an incubation period 6 months or less (dogs average 3 to 8 weeks; cats average 4 to 6 weeks). There is little information about incubation period in other animals. Variation is due to species exposed, size of viral inoculum, proximity of the bite to the nervous system, and virus variant.

G. Period of Communicability

Infected animals can transmit rabies when the infection has spread to the salivary glands, which typically occurs around or after the time that central nervous system (CNS) signs

develop. The rationale for a 10-day confinement period for dogs, cats and ferrets rests on this observed interval between viral shedding and onset based on experimental data. If communicable at the time of biting, these animals should develop CNS symptoms within 10 days. Confinement for animals other than dogs, cats or ferrets is not permitted because of a lack of information about period of communicability relative to symptoms.

3. CASE CLASSIFICATION

A. Classification in PHIMS

Animal Bites

Classification decisions can be made by each LHJ. Animal bites will not be reviewed in PHIMS by CDES unless requested by the LHJ.

Rabies PEP

Confirmed: Receipt of human rabies immune globulin (HRIG) and/or rabies vaccine (Human Diploid Cell vaccine [HCDV] or Purified Chick Embryo Cell Culture Vaccine [PCEC]) after presumed exposure to an animal (as opposed to pre-exposure vaccination).

If you do not have confirmation that PEP was initiated, but are confident that the person was seeking treatment, report the case as *probable*.

4. DIAGNOSIS AND LABORATORY SERVICES

Note: For information regarding laboratory diagnosis of human rabies please see the Rabies Surveillance and Reporting Guidelines (http://www.doh.wa.gov/notify/guidelines/pdf/rabies.pdf).

A. Diagnosis

Rabies testing in animals is done using a direct fluorescent antibody (DFA) test; fresh brain tissue (brainstem, cerebellum, and hippocampus) is required for this test. Tissues should not be submitted in formalin. Currently, there are no reliable, standardized ante-mortem (live animal) tests that can be used to confirm whether an animal is infected with rabies.

B. Tests Available at the Washington State Department of Health Public Health Laboratories (PHL)

PHL will perform DFA testing on animals that have potentially exposed a human to rabies. Brain tissue from non-bat animals with evidence of rabies by DFA will be forwarded to CDC for testing with monoclonal antibodies to determine the variant of the rabies virus. All submissions must be pre-approved by CDES (206) 418-5500.

Animals that have not potentially exposed a human to rabies can be tested for a fee (approximately $80) at Oregon State University Veterinary Diagnostics Laboratory (541) 737-3261.

C. Specimen Collection

Guidelines for submitting specimens can be found at:
http://www.doh.wa.gov/notify/other/rabiesspecimenguidelines_Aug06.pdf

Animal heads or whole bats must be shipped with a completed rabies specimen submission form (http://www.doh.wa.gov/notify/forms/rabiesspec.pdf).

5. ASSESSING THE NEED FOR PROPHYLAXIS AND FOLLOW-UP

The decision to recommend rabies PEP hinges on the answers to the following questions:

- Was there a human exposure?
- What is the risk that the animal in question was shedding rabies virus in the saliva at the time of the exposure?
- Can the animal be confined for a 10-day observation period (dogs, cats, and ferrets only) or is the animal head available for testing?

A. Was there a human exposure?

A human exposure has occurred if saliva or other potentially infectious material (such as central nervous system tissue) of an animal is introduced or potentially introduced into bite wounds, open cuts or abrasions in skin, mucous membranes (e.g., eyes, mouth or nose) or scratches. Limited evidence also suggests that rabies might be transmitted by exposure to very large amounts of aerosolized rabies virus (e.g., exposure to millions of bats in a cave).

Rabies is not transmitted by contact with blood, urine or feces, or by touching fur. The virus becomes inactive with drying.

Special Considerations for Bats

Bites by bats can cause minor injury and thus be undetected. "The risk for rabies resulting from an encounter with a bat might be difficult to determine because of the limited injury inflicted by a bat bite (compared with more obvious wounds caused by the bite of terrestrial carnivores), an inaccurate recall of a bat encounter that might have occurred several weeks or months earlier, and evidence that some bat-related rabies viruses might be more likely to result in infection after inoculation into superficial epidermal layers. For these reasons, any direct contact between a human and a bat should be evaluated for an exposure. If the person can be reasonably certain a bite, scratch, or mucous membrane exposure did not occur, or if the bat is available for testing and is negative for presence of rabies virus, postexposure prophylaxis is not necessary. Other situations that might qualify as exposures include finding a bat in the same room as a person who might be unaware that a bite or direct contact had occurred (e.g., a deeply sleeping person awakens to find a bat in the room or an adult witnesses a bat in the room with a previously unattended child, mentally disabled person, or intoxicated person). These situations should not be considered exposures if rabies is ruled out by diagnostic testing of the bat, or circumstances suggest it is unlikely that an exposure took place (MMWR 2008;57:RR-3)."

B. What is the risk that the animal in question was shedding rabies virus in the saliva at the time of the exposure?

The following factors should be assessed:

1. Epidemiology of Animal Rabies in the Place Where the Exposure Occurred

Decision to test an animal and/or administer rabies PEP will depend on the known epidemiology of rabies in the place of exposure (in Washington, out-of-state, out-of-country). If a person is exposed to an animal outside of Washington, the epidemiology of animal rabies in the area where the exposure occurred should be determined. Remember

that animals from elsewhere could be brought into Washington.

a. **Bats:** Bats serve as a reservoir for rabies throughout Washington State and the United States.

b. **Dogs, Cats and Ferrets:** Although rabies in dogs and cats is very rare in Washington, domestic animals can be exposed to rabies during encounters with wildlife. Even indoor pets can be exposed, since rabid bats in Washington have been found in people's homes. In 2002, a rabid cat was identified in Walla Walla with bat variant rabies. Nationally, more cats are reported to have rabies than dogs.

c. **Wild Terrestrial Carnivores (raccoon, skunks, foxes, coyote, wolves, bobcat-cat and wolf-dog hybrids, etc.):** Rabies has not been identified in wild carnivores tested in Washington in the past 25 years. However, DOH does not perform active surveillance for rabies in wild carnivores. Rabies testing is performed on the small number of wild carnivores that expose a human and are captured (see Appendix A). Furthermore, wild carnivores in Washington can become infected with rabies from bats. Evidence of transmission of bat-variant rabies among non-bat species[1] along with the possibility of translocation of rabid animals from other areas of the country[2,3] has the potential to rapidly change the epidemiology of rabies in Washington. Because the period of rabies virus shedding in these animals is unknown, these animals must be euthanized and tested rather than confined and observed when they bite humans.

[1]Leslie MJ, Messenger S, Rohde RE, Smith J, Cheshier R, Hanlon C, et al. Bat-associated rabies virus in skunks. Emerg Infect Dis 2006; 12:1274–7.

[2]Centers for Disease Control and Prevention. Translocation of Coyote Rabies -- Florida, 1994. MMWR 1994;44:580.

[3]Nettles VF, Shaddock JH, Sikes RK, CR Reyes. Rabies in translocated raccoons. Am J Public Health 1979;69:601–2.

d. **Rodents (mice, rats, squirrels, hamsters, etc.), Lagomorphs (rabbits, hares), and Opossum:** Rabies in rodents, lagomorphs, and opossum is very uncommon in the entire country. In the eastern United States, raccoon variant rabies occasionally spills over into large rodents, especially woodchucks.[1] Inoculation experiments with opossum in the 1960s found these animals to be relatively resistant to the rabies virus.[2]

[1]Childs JE, et al. Surveillance and spatiotemporal associations of rabies in rodents and lagomorphs in the United States, 1985–1994. Journal of Wildlife Diseases 1997;33(1):20–7.

[2]Beamer PD, Mohr CO, Barr TRB. Resistance of the Opossum to Rabies Virus. Am J Vet Res 1960;21:507–10.

e. **Livestock (cattle, sheep, goats, pigs, horse, llamas, etc.):** Although rabies in livestock is not common in Washington, animals can be exposed to rabies during encounters with wildlife. In addition, livestock that have been imported from areas of the United State where rabies reservoirs in skunks, raccoons and foxes exist should have rabies considered in the differential diagnosis of any acute, progressive, fatal neurological illness. In 1994, a rabid llama was identified in King County with bat variant rabies and in 1992 a rabid horse was identified from Franklin County.

2. Animal Behavior and History for Domestic Animals

a. Provoked versus unprovoked exposure: An unprovoked attack by an animal is more likely than a provoked attack to indicate that the animal is rabid. Examples of a provoked bite include startling an animal, running or biking past an animal, trying to capture an animal, or removing food, water or objects from the animal. Although bites from an injured animal are usually considered provoked, an ill animal may be more prone to trauma (e.g., being hit by a car).

b. Animal behavior and health status: Animals exhibiting unusual behavior that might be consistent with rabies (see Section 2B) are more likely to be rabid than animals acting normally. However, signs vary by species, can be either subtle or obvious and can include sudden death with few or no symptoms.

c. Animal vaccination history: Vaccinated dogs, cats, and ferrets are unlikely to become infected with rabies. However, it is possible that veterinary records show the animal is currently vaccinated but it is not immune to rabies due to vaccine inefficacy, vaccine mishandling, or poor documentation. Even if an animal is currently vaccinated, rabies cannot be ruled out. Vaccines given off-label to other species, including hybrids such as wolf-dog hybrids, are of unknown efficacy and should be disregarded when making a decision to recommend rabies PEP.

d. Previous history of biting: Bites by animals with a history of menacing or biting may reflect the animal's aggressive personality rather than infection with rabies virus.

e. Animal travel history: Animals that have recently (previous 6 months) traveled or lived in areas where rabies is endemic in wild carnivores are more likely to be infected than animals that have not left Washington.

C. Can the animal be confined for a 10-day observation period (dogs, cats, and ferrets only) or is the animal head available for testing?

When possible, any dog, cat or ferret (vaccinated or unvaccinated) that bites a person should be confined/observed for a 10-day period. Extreme care should be used to prevent exposure of additional persons to the confined animal. If there is no change in behavior after 10 days, the animal was not shedding the rabies virus at the time of exposure and rabies PEP should not be recommended or can be discontinued. If signs of rabies develop or the animal dies during the observation period, the local health department should be notified and the animal should be tested for rabies. Furthermore, if the animal must be euthanized for humane reasons and a 10-day observation period is not possible, the animal should be tested for rabies.

Because the period of rabies virus shedding in wild animals is unknown, these animals must be euthanized and tested rather than confined and observed when they expose humans. If an animal cannot be confined, or the animal head is unavailable or not testable, rabies PEP recommendation should be based on factors above.

For additional information, please refer to the most current ACIP recommendations (http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5703a1.htm) and the Compendium of Animal Rabies Prevention and Control (http://www.nasphv.org/Documents/RabiesCompendium.pdf).

6. RABIES PEP RECOMMENDATIONS

The decision to administer PEP should be made between the healthcare provider and the patient. Rabies PEP is imperative for any person exposed to an animal that tests positive for rabies.

A. Bat Exposure

In all instances of bat to human contact where rabies transmission is under consideration, the bat in question should be collected if possible, and submitted for rabies testing. Rabies PEP is recommended for all individuals exposed to a bat, unless the bat tests negative for rabies.

B. Dog, Cat or Ferret Exposure

If the dog, cat or ferret is not available for a 10-day observation period or testing, the decision to start prophylaxis is based on the circumstances of the exposure, the behavior of the animal and the history of the animal (see Section 5). PEP should be recommended if the animal was displaying unusual behavior that might be consistent with rabies or if the bite was unprovoked. In other situations, the patient and/or health care provider should be educated about the epidemiology of rabies in domestic animals in Washington to assist in their decision whether or not to start rabies PEP. This decision can be difficult since the risk of disease is low but the disease is nearly always fatal. If you have difficulty making a decision on PEP recommendation, CDES is available for consultation.

C. Wild Terrestrial Carnivore Exposure

According to the 2008 ACIP recommendations, "Raccoons, skunks, and foxes are the terrestrial carnivores most often infected with rabies in the United States. Suggestive clinical signs of rabies among wildlife cannot be interpreted reliably. All bites by such wildlife should be considered possible exposures to rabies virus. Postexposure prophylaxis should be initiated as soon as possible following exposure to such wildlife, unless the animal is available for diagnosis and public health authorities are facilitating expeditious laboratory testing, or if the brain tissue from the animal has already tested negative (MMWR 2008;57:RR-3)."

As discussed above, the risk of acquiring rabies after exposure to wild terrestrial carnivores in Washington is low (see Section 5B1c). PEP should be recommended if the wild terrestrial carnivore was displaying unusual behavior that might be consistent with rabies or if the bite was unprovoked. In other situations, the patient and/or health care provider should be educated about the epidemiology of rabies in wild terrestrial carnivores in Washington to assist in their decision whether or not to start rabies PEP. This decision can be difficult since the risk of disease is low but the disease is nearly always fatal. If you have difficulty making a decision on PEP recommendation, CDES is available for consultation.

D. Rodent (mice, rats, squirrels, voles, etc.), Lagomorph (rabbits, hares), and Opossum Exposure

Rabies PEP is rarely indicated after an exposure to a rodent, lagomorph, or opossum. If the animal was exhibiting signs consistent with rabies (see Section 2B) or the bite was

unprovoked, test the animal head for rabies. If the animal was exhibiting signs of rabies or the bite was unprovoked, and the animal is not available for testing, rabies PEP should be considered. The period of rabies virus shedding in these animals is unknown.

E. Livestock Exposure

There are no national guidelines for the management of livestock biting humans; each case should be evaluated on an individual basis.

7. RABIES PEP

The essential components of rabies PEP are wound treatment and, for previously unvaccinated persons, the administration of both HRIG and rabies vaccine. "Administration of rabies PEP is a medical urgency, not a medical emergency. Incubation periods of greater than 1 year have been reported in humans." Therefore, "when a documented or likely exposure has occurred, PEP should be administered regardless of the length of delay, provided that compatible clinical signs of rabies are not present in the exposed person (MMWR 2008;57:RR-3)."

A. Wound Treatment

Immediately wash all bite wounds and scratches with soap and water and a virucidal agent. Administer tetanus prophylaxis and measures to control bacterial infection as indicated.

B. Post-Exposure Immunization

Rabies vaccination should be administered according to the most current ACIP recommendations (MMWR 2008;57:RR-3).

Two cell-culture vaccines are available in the United States for rabies pre- and post-exposure prophylaxis in humans. They are equally safe and effective.

- Human diploid cell vaccine (HDCV)(Imovax®) is available from sanofi pasteur (1-800-822-2463) (http://www.vaccineplace.com/products).
- Purified chick embryo cell vaccine (PCEC) (RabAvert™) is available from Novartis Vaccines and Diagnostics (1-800-244-7668) (http://www.rabavert.com).

Two manufactures provide HRIG (for post-exposure use only) in the United States.

- Imogam Rabies –HT available from sanofi pasteur (1-800-822-2463) (http://www.vaccineplace.com/products).
- HyperRab™ S/D available from Talecris Biotherapeutics Bayer Biological Products (1-800-243-4153)(http://www.talecris-pi.info)

The appropriate protocol for rabies PEP depends on the exposed patient's previous rabies vaccination history:

1. Post-exposure protocol for people who have never been vaccinated against rabies:
   - One dose (20 IU/kg) of human rabies immune globulin (HRIG) is administered on day 0. If anatomically feasible, the full dose of HRIG should be thoroughly infiltrated in the area around and into the wounds. Any remaining volume should be

injected intramuscularly at a site distant from vaccine administration. HRIG should never be administered in the same syringe or in the same anatomical site as vaccine.

AND

- Five doses of cell culture rabies vaccine at 1 ml/dose administered intramuscularly in the deltoid muscle on days 0, 3, 7, 14, and 28. The anterolateral aspect of the upper thigh can be used in infants/young children. Administration of the vaccine should avoid the gluteal region.

  Note: "If HRIG was not administered when vaccination was begun (i.e. day 0), it can be administered up to and including day 7 of the postexposure prophylaxis series. Beyond the seventh day, HRIG is not indicated because an antibody response to cell culture vaccine is presumed to have occurred (MMWR 2008;57:RR-3)."

2. Post-exposure protocol for persons with a history of pre-exposure vaccination or post-exposure prophylaxis with cell culture vaccines (i.e., HDCV, RVA or PCEC):

   - Two doses of cell culture rabies vaccine (1 ml) administered intramuscularly in the deltoid muscle on days 0 and 3 after a rabies exposure.
   - HRIG is not indicated if previous pre- or post-exposure vaccination was done with cell culture vaccines (available in the United States after 1980).

     If the exposed patient was previously immunized with other vaccines not produced on cell culture (e.g., duck embryo, suckling mouse brain, inactivated nerve tissue), consult with CDES.

C. Timing of Rabies PEP

All wounds from potentially rabid animals should be immediately cleaned as described above. National recommendations are that persons bitten by animals known or suspected to be rabid should be given HRIG and vaccine urgently (MMWR 2008;57:RR-3) since the time which can pass between an exposure and effective administration of HRIG and vaccine is unknown.

Factors to consider when determining the speed of administering HRIG and rabies vaccine include the likelihood that rabies was transmitted and the anatomic proximity of the bite to the central nervous system. In high-risk situations (e.g., bat bite to the face), CDES recommends that HRIG and rabies vaccine be administered immediately, before laboratory results are available. Conversely, in lower-risk situations (e.g., bat found in the bedroom, provoked bite by healthy cat), initiation of PEP can be delayed until testing of the animal or 10-day observation (dog, cat and ferret only) is complete (PHL will usually have results within one working day of specimen arrival). If you have difficulty deciding whether or not to delay PEP until the animal is tested, consult with CDES.

D. Deviations from Recommended Vaccination Schedules

Arrangements should be made so that patients do not deviate from the recommended postexposure prophylaxis vaccination schedule. However, occasionally lapses are unavoidable. If a delay of a few days occurs, vaccination schedule should be resumed as if the patient were on schedule. When longer delays occur, serologic testing should be

preformed 7 to 14 days after the final dose in the series to assess immune status (MMWR 2008;57:RR-3).

E. Postexposure Prophylaxis Outside the United States

Patients exposed to rabid animals in foreign countries may start a post-exposure prophylaxis regimen with a vaccine that is unavailable in the United States. "If postexposure prophylaxis is initiated outside the United States using one of these regimens or vaccines of nerve tissue origin, additional prophylaxis might be necessary when the patient presents for care in the United States. State or local health departments should be contacted for specific advice in such cases. Rabies virus neutralizing antibody titers from specimens collected 1 to 2 weeks after pre-exposure or postexposure prophylaxis would be considered adequate if complete neutralization of challenge virus at a 1:5 serum dilution by RFFIT occurs. (MMWR 2008;57:RR-3)."

F. Adverse Reactions Associated with Post-Exposure Immunization

Prophylaxis should not be discontinued due to reactions without considering the patient's risk of acquiring rabies. Any unusual or severe adverse reactions attributed to vaccines or HRIG should be reported to the local health jurisdiction, CDES, Vaccine Adverse Events Reporting System (VAERS: http://vaers.hhs.gov/) and to the vaccine manufacturer.

For additional information, please refer to the most current ACIP recommendations (http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5703a1.htm).

8. MANAGING SPECIAL SITUATIONS

A. Dogs, Cats, or Ferrets Exposed to a Potentially Rabid Animal

When a domestic animal has direct contact with a rabid or suspect rabid wild animal, it is considered to have had a potential exposure to rabies. It is very important to capture and submit such wild animals for rabies testing if possible.

If the exposed dog/cat is currently vaccinated (see below) against rabies:

1. Immediately take the animal to a veterinarian for a booster rabies vaccination.
2. Confine the dog or cat under the owner's control and close observation for 45 days. The animal should be kept at home or in a building, pen, or escape-proof enclosure. The animal should only be removed from confinement on a leash and under supervision of a responsible adult. At the first sign of illness or behavioral change, the animal should be taken to a veterinarian, and the health department should be contacted immediately.

If the exposed dog/cat has never been vaccinated against rabies:

1. Consider immediate humane euthanasia OR
2. Set up strict quarantine of the animal for 180 days (6 months).
   a) If the quarantine is in an animal control or veterinary facility, the owner should be made aware of the cost, and the facility should agree to the terms of confinement as decided by the local health officer.

b) A veterinarian should vaccinate the animal against rabies either on entry into the quarantine, or before the 150th day to assure that the animal is currently immunized when released.

Animals that have been vaccinated in the past but are overdue for rabies vaccines should be handled on a case-by-case basis. There are currently no USDA licensed biologics for post-exposure prophylaxis of domestic animals, and there is evidence that the use of vaccine alone will not reliably prevent the disease in these animals.

B. Rabies Vaccine for Animals

There are formulations of rabies vaccine licensed for cats, dogs, and ferrets, as well as horses, cattle, and sheep. An animal's vaccine status is up-to-date if the initial vaccination was administered at least 28 days previously or booster vaccinations have been administered in accordance with the most current *Compendium of Animal Rabies Prevention and Control*. A booster vaccination should be administered 1 year after the initial vaccination regardless of the animal's age at first vaccination. An animal is considered currently vaccinated immediately after a booster vaccination (MMWR 2008;57:RR-2).

For additional information, please refer to the Compendium of Animal Rabies Prevention and Control (http://www.nasphv.org/Documents/RabiesCompendium.pdf, MMWR 2008;57:RR-2).

C. Exposure to a Human with Rabies

Although person-to-person transmission of rabies by bite has never been confirmed, rabies PEP is recommended for persons who have exposure (Section 5A) to a human with rabies. Consult with CDES regarding PEP of persons exposed to a human with rabies.

9. ROUTINE PREVENTION

A. Human Pre-exposure Immunization

Rabies pre-exposure vaccinations are administered to individuals such as laboratory workers testing for rabies virus, veterinarians and their staff, wildlife biologists, rehabilitators, animal control officers who routinely have contact with stray domestic, exotic, and/or wild animals, and travelers staying for prolonged periods in rabies enzootic areas where medical care may be difficult to obtain. Pre-exposure immunization consists of three cell culture rabies vaccinations given on days 0, 7, and 21 or 28. For information regarding checking rabies titers, see the most current ACIP recommendations (MMWR 2008;57:RR-3).

B. Prevention Recommendations

1. Be a responsible pet owner:

- Keep vaccinations up-to-date for all dogs, cats and ferrets. This is important not only to keep your pets from getting rabies, but also to provide a barrier of protection to you, if your animal is bitten by a rabid wild animal.
- Keep your pets under direct supervision so they do not come in contact with wild animals. If your pet is bitten by a wild animal, seek veterinary assistance for the animal immediately.

- Call your local animal control agency to remove any stray pets from your neighborhood. They may be unvaccinated and could be infected by the disease.
- Spay or neuter your pets to help reduce the number of unwanted pets that may not be properly cared for or regularly vaccinated.

2. Avoid direct contact with unfamiliar animals

- Enjoy wild animals (raccoons, skunks, foxes) from afar. **Do not** handle, feed, or unintentionally attract wild animals with open garbage cans or litter.
- **Never** adopt wild animals or bring them into your home. **Do not** try to nurse sick wild animals. Call animal control or a wildlife rescue agency for assistance.
- Teach children **never** to handle unfamiliar animals, wild or domestic, even if they appear friendly. "Love your own, leave other animals alone" is a good principle for children to learn.
- Prevent bats from entering living quarters or occupied spaces in homes, churches, schools, or other similar areas, where they might come in contact with people or pets.
- When traveling abroad, avoid direct contact with wild animals and be especially careful around dogs in developing countries. Rabies is common in developing countries in Asia, Africa, and Latin America where dogs are the major reservoir of rabies. Before traveling abroad, consult with a health care provider, travel clinic, or your health department about the risk of exposure to rabies, pre-exposure prophylaxis, and how you should handle an exposure, should it arise.

3. Keep bats out of your home

Some bats live in buildings, and there may be no reason to evict them if there is little chance for contact with people. However, bats should always be prevented from entering rooms of your home. For assistance with "bat-proofing" your home, contact an animal-control or wildlife conservation agency. If you choose to do the "bat-proofing" yourself, here are some suggestions.

- Carefully examine your home for holes that might allow bats entry into your living quarters. Any openings larger than a quarter-inch by a half-inch should be caulked.
- Use window screens, chimney caps, and draft-guards beneath doors to attics, fill electrical and plumbing holes with stainless steel wool or caulking, and ensure that all doors to the outside close tightly.
- Additional "bat-proofing" can prevent bats from roosting in attics or buildings by covering outside entry points. Observe where the bats exit at dusk and exclude them by loosely hanging clear plastic sheeting or bird netting over these areas. Bats can crawl out and leave, but cannot re-enter. After the bats have been excluded, the openings can be permanently sealed.

ACKNOWLEDGEMENTS

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UPDATES

June 2008: Changes were made to sections 5 through 9 to be consistent with the updated "Compendium of Animal Rabies Prevention and Control, 2008" and "Human Rabies Prevention --- United States, 2008 Recommendations of the Advisory Committee on Immunization Practices".

In section 7, "Deviations from Recommended Vaccination Schedules" and "Postexposure Prophylaxis Outside the United States" were added.

APPENDIX A

Washington State Animals Tested for Rabies, 1988-2007
(Rabid animals in parentheses)

Year	Bat	Cat	Dog	Ferret	Raccoon	Skunk	Rodent	Lago-morph	Other Wild	Other Domestic	Total
1988	69 (4)	165	110	15	16	3	12	2	5	3	400
1989	102 (9)	124	91	20	9	4	8	1	9	4	372
1990	63 (4)	104	82	5	7	5	5	1	14	4	290
1991	90 (9)	105	96	13	8	3	13	0	19	2	349
1992	73 (6)	132	90	16	14	2	12	0	14	6 (1)*	359
1993	68 (1)	122	95	8	4	8	16	2	10	13	346
1994	58 (14)	105	90	7	4	3	15	0	16	14 (1)^	312
1995	263 (15)	140	114	12	8	1	23	3	15	18	597
1996	257 (13)	104	101	8	9	2	14	3	20	12	530
1997	780 (51)	155	118	7	17	4	15	2	18	11	1127
1998	447 (27)	126	109	8	11	1	6	0	19	16	743
1999	334 (25)	103	71	3	11	3	8	1	14	13	561
2000	330 (23)	105	60	1	2	4	6	1	9	4	522
2001	263 (22)	111	93	2	3	1	8	0	4	5	490
2002	186 (12)	99 (1)	53	7	2	2	9	1	8	9	376
2003	229 (23)	137	72	0	11	1	4	1	9	10	474
2004	311 (20)	141	70	3	13	6	11	0	6	10	571
2005	245 (15)	132	66	3	12	2	5	1	10	4	480
2006	273 (15)	105	70	4	13	1	2	1	8	5	482
2007	315 (22)	132	97	1	16	3	5	0	9	3	581
Total 1988-2007	**4756 (330)**	**2447 (1)**	**1748 (1)**	**143**	**190**	**59**	**197**	**20**	**236**	**166 (2)**	**9962 (333)**

* Horse
^ Llama
Rodents include: beaver, chinchilla, chipmunk, degu, gerbil, gopher, hamster, marmot, mouse, muskrat, nutria, porcupine, prairie dog, rat, squirrel, vole, woodchuck

Lagomorphs include: rabbit and pika
Other domestic include: burro, cattle, goat, horse, llama, mule, pig, sheep
Other wild include: badger, bear, bison, bobcat, cougar, coyote, deer, fox, kinkajou, lynx, marten, mink, mole, monkey/non-human primate, ocelot, opossum, otter, seal, shrew, weasel, wolf, wolfhybrid, zorilla